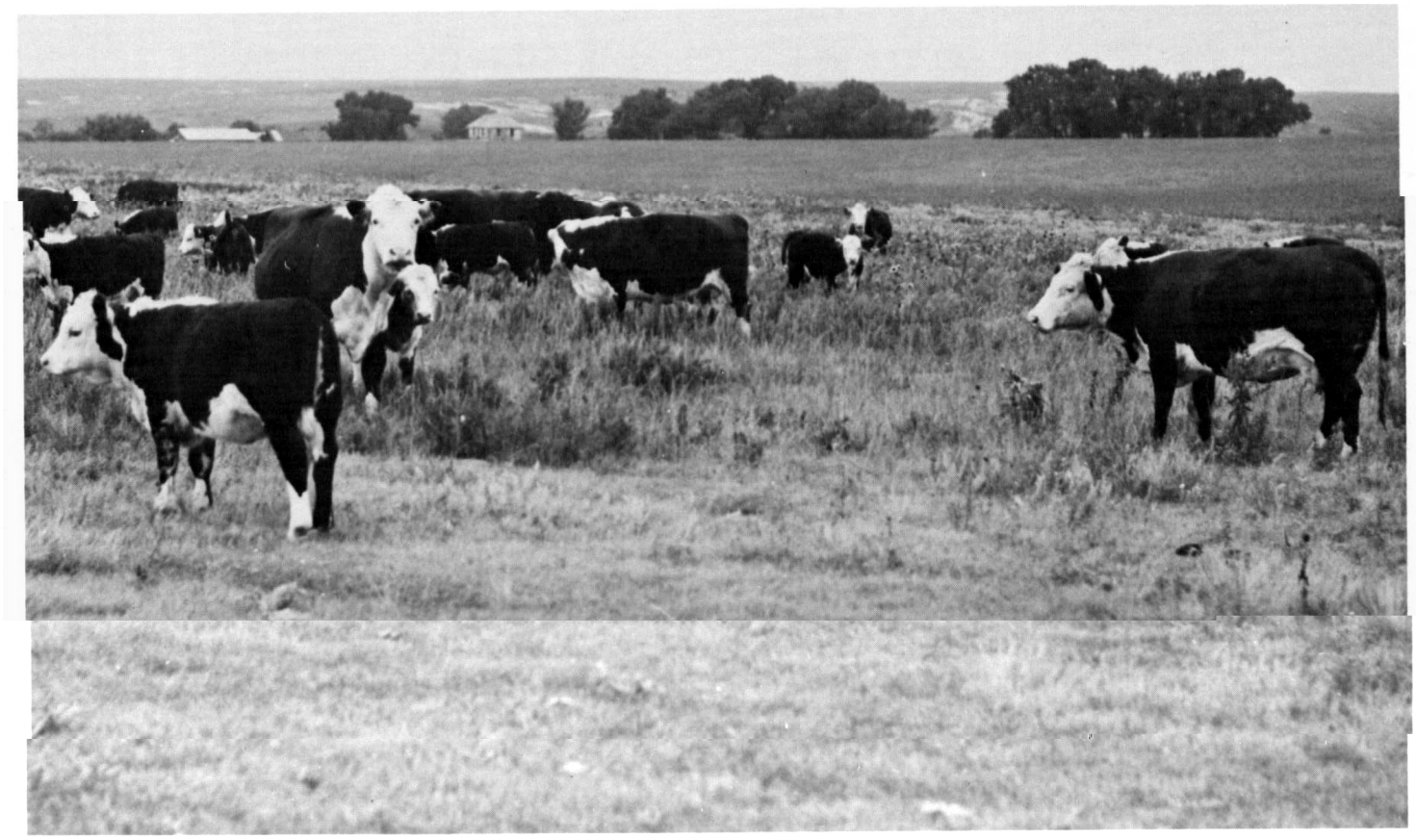
SOIL SURVEY OF

Ness County, Kansas



United States Department of Agriculture
Soil Conservation Service
In cooperation with
Kansas Agricultural Experiment Station

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in the period 1963–70. Soil names and descriptions were approved in 1971. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1970. This survey was made co-

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SOIL SURVEY OF NESS COUNTY, KANSAS

BY DONALD E. ROTT AND ROGER L. HABERMAN

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE KANSAS AGRICULTURAL EXPERIMENT STATION

NESS COUNTY, in the west-central part of Kansas, covers a total area of 1,081 square miles, or 691,840 acres (fig. 1). Ness City, near the center of the county, is the county seat.

Farming is the most important enterprise in the county. Wheat and grain and forage sorghum are the main dryland crops. Some corn and alfalfa are grown in the valleys. Beef cattle are the main kind of livestock in the county. Some dairy cows, sheep, hogs, and poultry are also raised.

Most of the soils in the Pawnee River Valley are irrigated. Soils in the Walnut Creek Valley, in areas where an adequate supply of good quality water is available, are also irrigated.

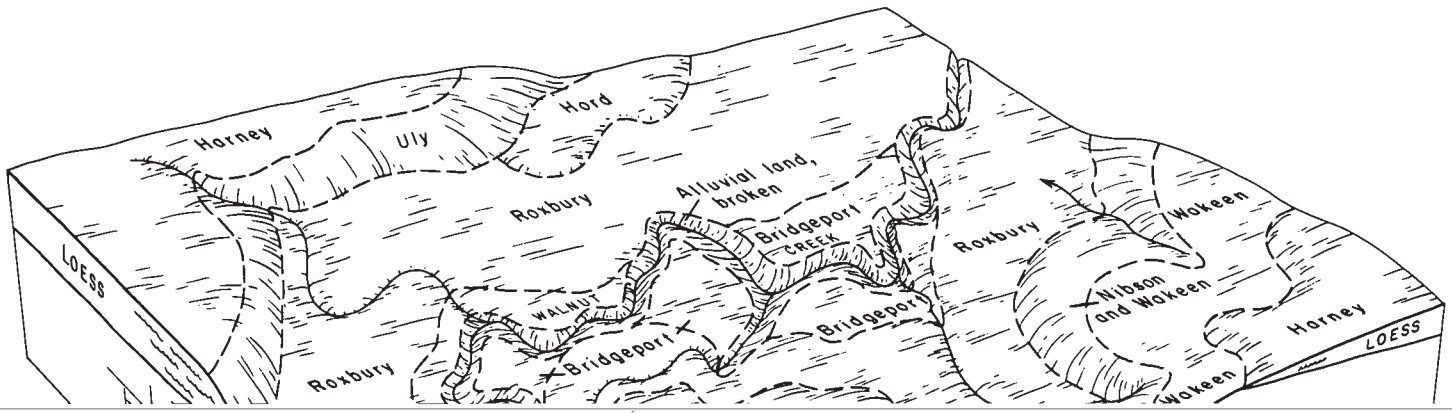
Ness County is in two major land resource areas. The western part is in the Central High Table Land [illegible] and the eastern part is in the Rolling Plains and

and how they can be used. They went into the county knowing that they probably would find many soils they had already seen, and perhaps some unfamiliar ones. They observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants or crops, the kinds of rock, and many facts about the soils. They dug or bored many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed greatly by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these with others in nearby counties and in more distant places. They classified and named the soils according to uniform [illegible]

unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area

soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one


Harney
Uly
Hord
Roxbury
Alluvial land, broken
Bridgeport
CREEK
Roxbury
Wakeen
Nibson and Wakeen
Harney
LOESS
Wakeen
Bridgeport
WALNUT
Bridgeport
Roxbury
LOESS

are short in most places and are steeper than in other parts of the association.

This association occupies about 70 percent of the county. It is about 61 percent Harney soils, 20 percent Uly soils, 9 percent Coly soils, and 10 percent minor soils (fig. 3).

Harney soils are gently sloping and are in broad areas. They are well drained. In a typical profile the surface layer is about 11 inches thick. The upper part of this layer is grayish-brown silt loam, and the lower part is dark grayish-brown light silty clay loam. The subsoil is about 22 inches thick. The upper part of the subsoil is grayish-brown heavy silty clay loam, and the lower part is very pale brown silty clay loam. The underlying material is very pale brown light silty clay loam.

Uly soils are gently sloping and sloping and are well drained. In a typical profile the surface layer is dark grayish-brown silt loam about 8 inches thick. The subsoil is grayish-brown heavy silt loam about 8 inches thick. The underlying material is pale-brown and light-brown light silty clay loam.

Coly soils are gently sloping and sloping and are well drained to somewhat excessively drained. In a typical profile the surface layer is grayish-brown silt loam about 3 inches thick. The next layer is pale-brown silt loam about 11 inches thick. The underlying material is a very pale brown silt loam.

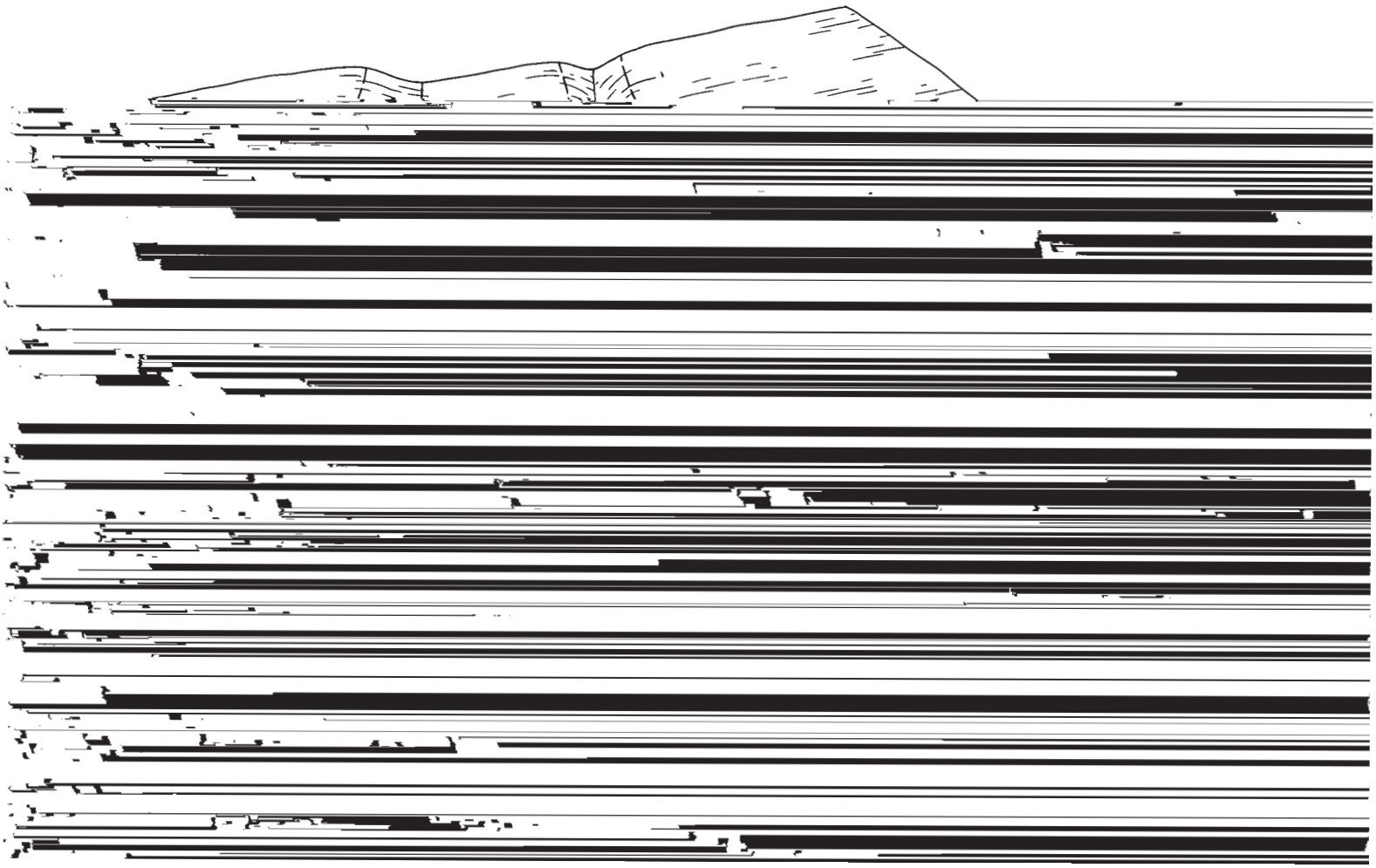
The minor soils in this association are in the Bridgeport, Corinth, Heizer, Penden, Roxbury, Timken, and Wakeen series. Bridgeport and Roxbury soils occupy narrow, low flood plains that are subject to frequent flooding and, in some places, are interrupted by old abandoned stream channels. Heizer and Timken soils are mainly on the short, steep breaks adjoining deeply incised drainageways or valley floors. Corinth soils are mainly on narrow side slopes and are underlain by calcareous shale. Penden soils are sloping and are underlain by loamy sediment. Wakeen soils are gently sloping and sloping and are underlain by chalky limestone.

The major enterprises on this association are the growing of cash crops and raising of beef cattle. A large part of the association is cultivated, mainly to wheat and sorghum. The strongly sloping to steep soils are in grass and are used as range. The major soils have a high available water capacity. Harney soils have high fertility, and Uly and Coly soils have moderate fertility. The main concerns in managing cultivated fields are conserving moisture, controlling water erosion and soil blowing, and keeping the soils in good tilth.

4. Heizer-Wakeen-Uly association

Shallow to deep, sloping to steep, loamy soils on uplands

This association is dissected by drainageways.



Slopes are irregular, and the elevation varies considerably over short distances. Bands of rock outcrop are common in most places.

This association occupies about 10 percent of the county. It is about 30 percent Heizer soils, 30 percent Wakeen soils, 20 percent Uly soils, and 20 percent minor soils (fig. 4).

Heizer soils are sloping to steep and are well drained. In a typical profile the surface layer is grayish-brown loam about 6 inches thick. The next layer is gray gravelly loam about 3 inches thick. The underlying material is light brownish-gray channery loam. Chalky limestone is at a depth of about 13 inches.

Wakeen soils are gently sloping to moderately steep and are well drained. In a typical profile the surface soil is grayish-brown heavy silt loam about 8 inches thick. The underlying material is pale-brown and light-brown silty clay loam.

The minor soils in this association are dominantly in the Coly, Harney, Penden, Nibson, and Timken series. Coly and Penden soils are sloping and have short slopes. Harney soils are gently sloping and have longer slopes. Nibson soils are gently rolling to steep and are underlain by chalky shale. Timken soils occupy rough, hilly slope breaks and areas adjacent to deeply incised drainageways. Rock outcrops are common in areas of Heizer and Wakeen soils.

Nearly all of this association is in grass and is used as range. A few large areas of the gently sloping and sloping Wakeen and Uly soils are cultivated to wheat

5. *Campus-Canlon-Penden association*

Shallow to deep, gently sloping to steep, loamy soils on uplands

This association consists of irregularly sloping areas in which the elevation varies greatly over short distances. Bands of rock outcrop are common in most places.

This association occupies about 3 percent of the county. It is about 30 percent Campus soils, 22 percent [illegible] soils, and 28 percent

brownish-gray loam. Hard caliche is at a depth of about 14 inches.

Penden soils are gently sloping to moderately steep and are well drained. In a typical profile the surface layer is about 14 inches thick. The upper 8 inches of this layer is dark grayish-brown light clay loam, and the lower 6 inches is grayish-brown clay loam. The underlying material is pale-brown clay loam.

The minor soils in this association are in the Coly, Heizer, Uly, and Wakeen series. Some small areas of [illegible] included. Coly and Uly soils are

high available water capacity. Campus and Penden soils have moderate fertility. Canlon soils have low fertility. The main concerns in managing cultivated fields are conserving moisture and controlling surface runoff and soil blowing. The main concern in managing grassland is maintaining a vigorous stand of desirable grass.

Descriptions of the Soils

This section describes the soil series and mapping units in Ness County. Each soil series is described in considerable detail, and then, briefly, each mapping unit in that series. Unless it is specifically stated otherwise, the

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Area	Extent
	Acres	*Percent*
Alluvial land, broken	8,730	1.3
Bridgeport silt loam	13,250	1.9
Campus-Canlon complex	10,340	1.5
Coly-Uly silt loams, 3 to 6 percent slopes, eroded	21,360	3.1
Detroit silty clay loam	840	.1
Harney silt loam, 0 to 1 percent slopes	171,440	24.8
Harney silt loam, 1 to 3 percent slopes	170,660	24.7
Harney silty clay loam, 1 to 3 percent slopes		

The low bottom lands are loamy, subject to frequent overflow, and generally well drained.

This mapping unit is better suited to range than to most other uses because of the steep slopes and the frequent flooding of the bottom lands. The vegetation is mainly annual weeds and grasses, but there is some western wheatgrass. Elm, ash, willow, and cottonwood trees grow on some of the narrow bottom lands near the base of the steep banks. In some places, waterholes dry up only in times of prolonged drought. Dryland

a few small areas of Roxbury and Hord soils and a few small areas of a soil that is similar to Bridgeport soils but is more sandy.

Wheat and sorghum are the main dryland crops grown on this soil. Corn and alfalfa are commonly grown under irrigation. Some places in the lower areas are subject to occasional flooding, which harms crops and delays tillage and planting. This soil blows when dry if it lacks a protective cover of crop residue or vegetation. Stubble-mulch tillage helps to conserve

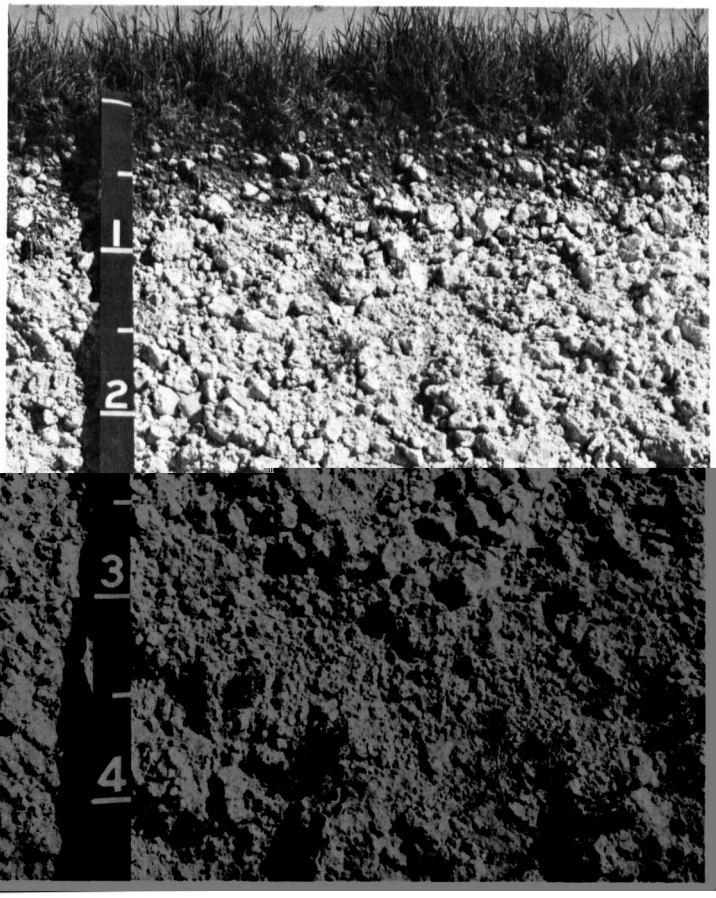
of caliche; strongly effervescent; moderately alkaline; gradual, smooth boundary.

AC—4 to 9 inches, grayish-brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak, fine, granular structure; slightly hard, friable; common fine roots; common small fragments of limestone and caliche; strongly effervescent; moderately alkaline; clear, smooth boundary.

C—9 to 14 inches, light brownish-gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak, medium, granular structure; slightly hard, friable; common fine roots; many fragments of limestone and caliche; violently effervescent; moderately alkaline; clear, wavy boundary.

R—14 inches, hard caliche.

The A1 horizon ranges from dark grayish brown or brown



lands. These soils formed in loess. Slopes are about 1 to

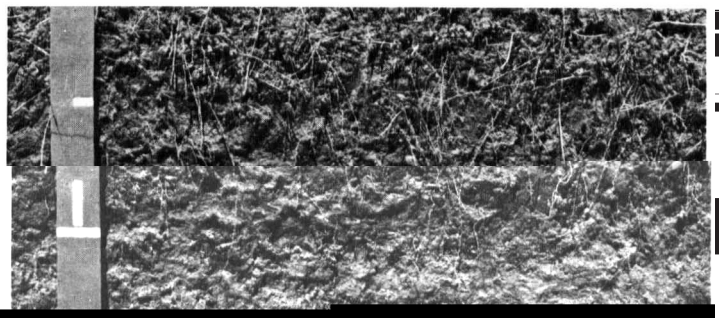
Corinth Series

grayish-brown silty clay loam about 9 inches thick. The subsoil is about 27 inches thick. In the upper 16 inches it is dark grayish-brown, firm light silty clay; in the lower 11 inches it is grayish-brown and brown, firm silty clay loam. The underlying material is pale-brown silty clay loam.

Detroit soils are well drained to moderately well

uplands. These soils formed in loess. Slopes are about 0 to 3 percent.

In a representative profile the surface layer is about 11 inches thick (fig. 9). The upper 5 inches of this layer is grayish-brown silt loam; the lower 6 inches is dark grayish-brown light silty clay loam. The subsoil is about 22 inches thick. The upper 13 inches of the



structure; very hard, firm; few fine roots; few worm casts; neutral; gradual, smooth boundary.

B22t—17 to 24 inches, grayish-brown (10YR 5/2) heavy silty clay loam, dark grayish brown (10YR 4/2)

unit IIe–1, irrigated capability unit IIe–1; Loamy Upland range site; windbreak suitability group 2.

Harney silty clay loam, 1 to 3 percent slopes, eroded

[redacted]

uplands. These soils formed in material weathered from chalky limestone (fig. 10). Slopes are about 3 to 30 percent. Chalky limestone is at a depth of 10 to 20 inches. In this county these soils are mapped only in complexes with Wakeen soils and with Rock land.

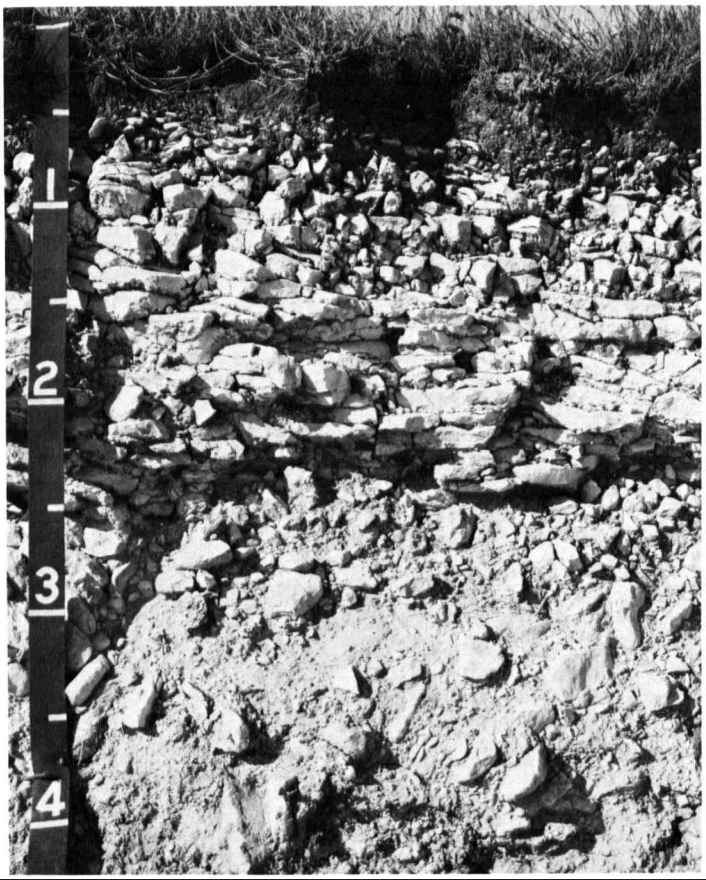
In a representative profile the surface layer is grayish-brown loam about 6 inches thick. The next layer is gray, friable gravelly loam about 3 inches thick. The underlying material is light brownish-gray channery loam. Consolidated chalky limestone is at a depth of 13 inches.

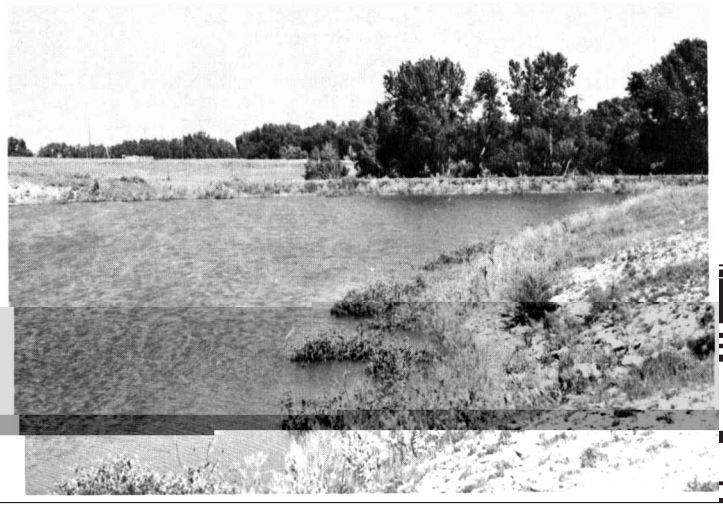
Heizer soils are well drained and have moderate

nery loam, dark grayish brown (10YR 4/2) moist; weak, fine, granular structure; slightly hard, friable; few fine roots; common to many fragments of limestone, 1 to 6 inches in length; violently effervescent; moderately alkaline; clear, smooth boundary.

R—13 inches, consolidated chalky limestone.

The A horizon ranges from very gray or very dark grayish brown to gray or grayish brown and is 6 to 10 inches thick. This horizon is loam or gravelly loam. The AC horizon ranges from gray or grayish brown to light brownish gray. It is gravelly loam or channery loam and is 2 to 4 inches thick. The C horizon ranges from grayish brown or brown to light gray or very pale brown. These soils are calcareous to the surface





range site, Wakeen soil is in Limy Upland range site; windbreak suitability group not assigned.

Hord Series

The Hord series consists of deep, loamy soils on stream terraces. These soils formed in silty alluvium or [illegible]. The dominant slopes are 0 to 1 percent.

Ness Series

The Ness series consists of deep, clayey soils on floors of enclosed depressions that vary from a few inches to several feet below the level of surrounding soils. Dominant slopes are less than 1 percent.

In a representative profile the surface layer is dark-gray clay about 14 inches thick. The next layer is

county these soils are mapped only in a complex with Wakeen soils.

In a representative profile the surface layer is grayish-brown silt loam about 8 inches thick. The subsoil is light brownish-gray, friable light silty clay loam about 5 inches thick. Hard chalky shale is at a depth of 17 inches.

Nibson soils are somewhat excessively drained and have moderate permeability. They have a very low available water capacity and low fertility.

Representative profile of Nibson silt loam, in an area of Nibson-Wakeen complex, 1,010 feet east and 655 feet south of the northwest corner of sec. 7, T. 19 S., R. 21 W., in range:

A1—0 to 8 inches, grayish-brown (2.5Y 5/2) silt loam, very dark grayish brown (2.5Y 3/2) moist; moderate, fine and medium, granular structure; slightly hard, friable; many fine roots; small limestone and chalky fragments make up less than 15 percent of the soil mass; strongly effervescent; moderately alkaline; clear, smooth boundary.

B2—8 to 13 inches, light brownish-gray (2.5Y 6/2) light silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate, medium, granular structure; slightly hard, friable; many fine roots; few fragments of limestone and shale that make up less than 15 percent of the soil mass; strongly effervescent; moderately alkaline; clear, smooth boundary.

C1—13 to 17 inches, very pale brown (10YR 7/3) light silty clay loam, brown (10YR 5/3) moist; weak, thin, platy and weak, medium, granular structure; slightly hard, friable; few fine roots; many small

maintain a desirable stand of native grasses. Dryland capability unit VIe–2; Limy Upland range site; windbreak suitability group not assigned.

Penden Series

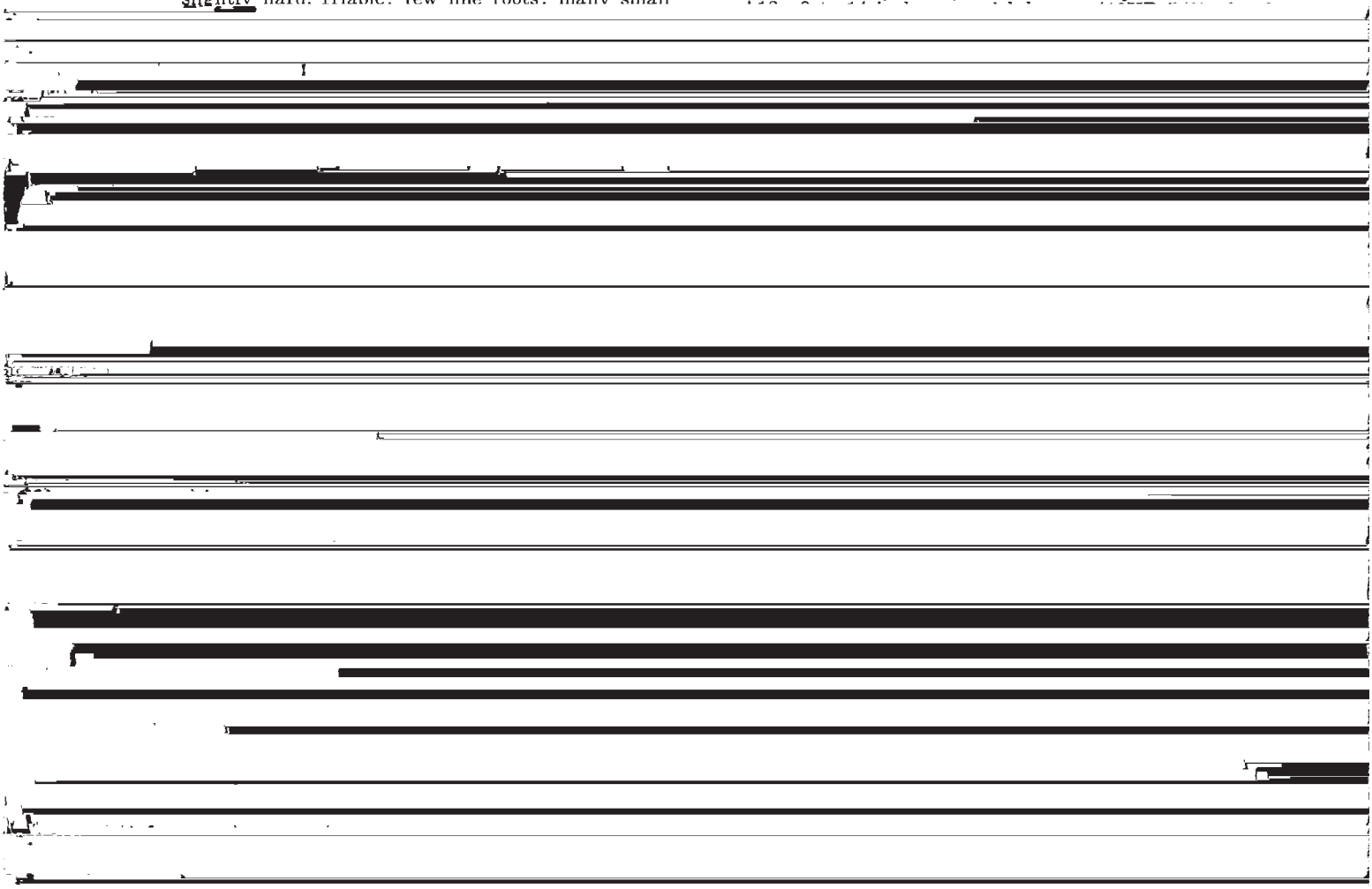
The Penden series consists of deep, loamy soils on uplands. These soils formed in calcareous loamy sediment that is modified in some places by more silty loess material. Slopes are 3 to 20 percent.

In a representative profile the surface layer is about 14 inches thick. The upper 8 inches of this layer is dark grayish-brown light clay loam; the lower 6 inches is grayish-brown clay loam. The underlying material is pale-brown clay loam that extends to a depth of 60 inches. The upper part is firm, and the lower part is friable.

Penden soils are well drained and have moderately slow permeability. They have a high available water capacity and moderate fertility.

Representative profile of Penden clay loam, 3 to 6 percent slopes, 300 feet west and 1,400 feet north of the southeast corner of sec. 11, T. 17 S., R. 26 W., in range:

A11—0 to 8 inches, dark grayish-brown (10YR 4/2) light clay loam, very dark brown (10YR 2/2) moist; moderate, medium, granular structure; hard, friable; many fine roots; few worm casts; few coarse sand grains; strongly effervescent; mildly alkaline; gradual, smooth boundary.

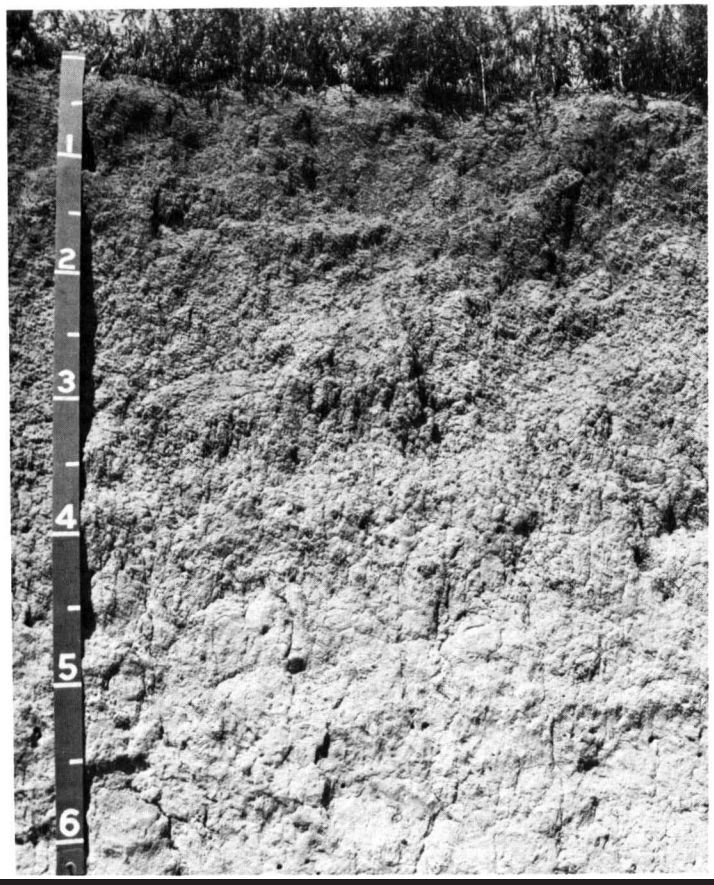


profile described as representative of the series. Included with this soil in mapping are a few small areas of Uly, Coly, Wakeen, and Campus soils.

Wheat and sorghum are the main crops grown on

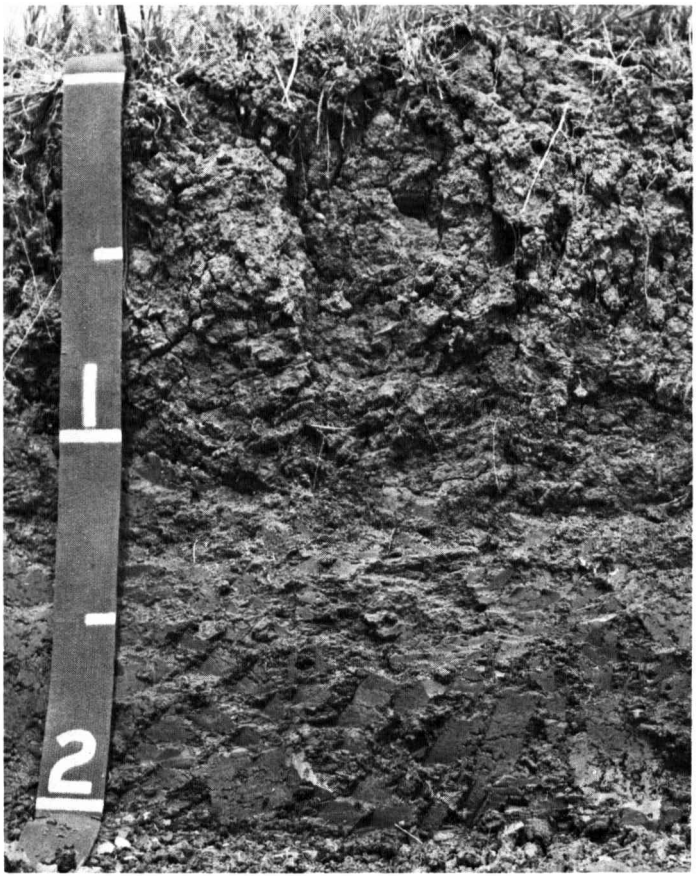
Dryland capability unit VIe–1; Limy Upland range site; windbreak suitability group not assigned.

Rock Land



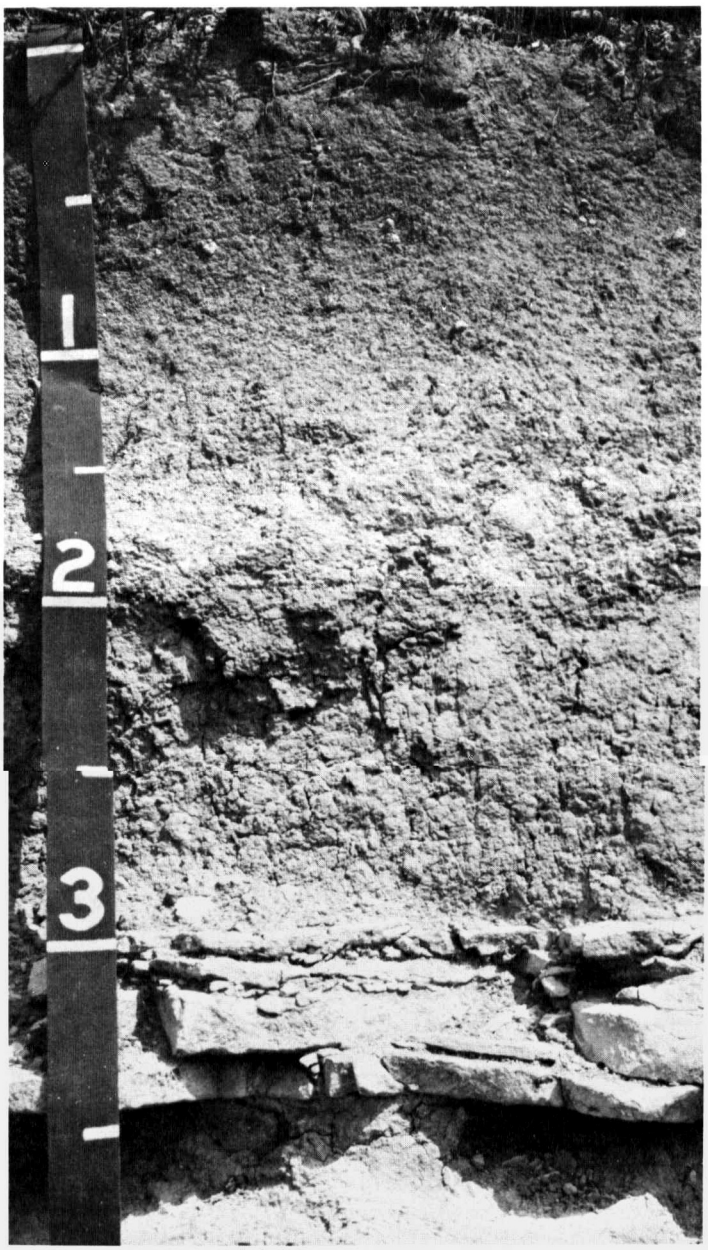
plains that are cut in some places by meandering stream channels. Included with it in mapping are small areas of Bridgeport and other similar soils.

Wheat, sorghum, and alfalfa are the main crops grown on this soil. In some years flooding delays planting or harvesting or destroys the crop. In a few places the water table is high enough to be helpful to deep-



[redacted]

has been thinned by erosion. In most places, material from the subsoil has been mixed into the plow layer and the soil is calcareous to the surface. The Coly soil



tive of its series.

effervescent; moderately alkaline; gradual, smooth boundary.

C1—23 to 32 inches, very pale brown (10YR 7/3) silty clay loam, brown (10YR 5/3) moist; weak, coarse, blocky structure parting to weak, fine, granular; some weak platy structure just above bedrock; hard, friable; few fine roots; common masses or pockets of chalky material; violently effervescent; strongly alkaline; clear, smooth boundary.

C2—32 inches, white (10YR 8/2) chalky limestone.

The A horizon ranges from very dark grayish brown or dark brown to grayish brown or brown and is 7 to 18 inches thick. This horizon is silt loam or silty clay loam. The B horizon ranges from grayish brown or brown to light gray or very pale brown. It is dominantly silty clay loam and is about 6 to 15 inches thick. The C horizon ranges from light brownish gray or pale brown to nearly white or very pale brown and is dominantly silty clay loam. The C horizon is about 7 to 15 inches thick. Chalky limestone is at a depth of 20 to 40 inches. Depth to carbonates is less than 12 inches.

Wakeen soils are near Heizer and Nibson soils. Wakeen soils are 20 to 40 inches deep over chalky limestone; Heizer soils are 10 to 20 inches deep to chalky limestone, and Nibson soils are 10 to 20 inches deep to chalky shale.

Wakeen silt loam, 1 to 3 percent slopes (Wb).—This soil has relatively short slopes and is on uplands. It

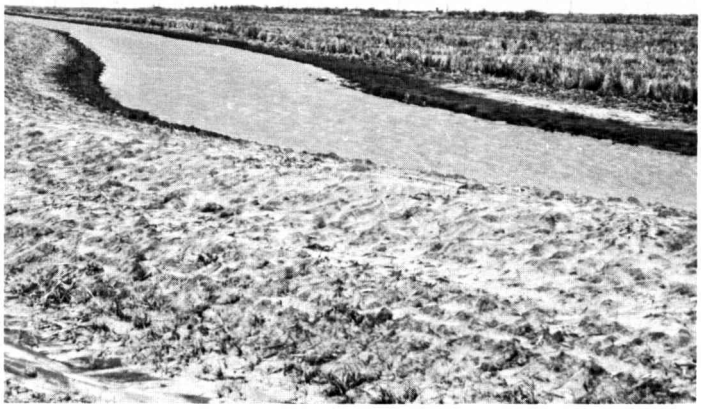
ing to the Conservation Needs Inventory of 1967, about 60 percent of the county is dry farmed and about 1 percent is irrigated.

In this section, management of soils for both dryland and irrigated crops is discussed, the system of capability grouping is explained, and the capability groups in Ness County are described. A table shows predicted yields for both dryland and irrigated crops. Use of the soils for windbreaks, range, wildlife, recreation, and engineering are also discussed.

Management of the Soils for Dryland Crops

In Ness County the management of soils for dryland crops consists of a combination of practices that reduce water erosion and soil blowing, help to maintain good soil structure and an adequate organic-matter content, and conserve as much rainfall as possible. Erosion control and water conservation are most successful if a proper combination of practices is used.

In most years the lack of adequate rainfall limits



a tillage pan to form, particularly in the loam and silt loam soils. Emergency tillage is sometimes used to help control soil blowing in fields when the soil is bare, for instance, when a recently prepared seedbed has started to blow.

Wheat and sorghum are the major dryland crops

is grown on bottom land. The sequence of crops grown affects the combination of management practices needed on a particular soil. Close-growing crops, such as wheat, provide more protection for the soil than row crops, and the residue from wheat provides more protection than the residue from grain sorghum.

Management of the Soils for Irrigated Crops

The factors to be considered in planning an irrigation system are the characteristics and properties of the soil, the quality and quantity of irrigation water available, the crops to be irrigated, and the type of irrigation system to be used. It is especially important to know the quality of the irrigation water so that the longtime effect of irrigation on the soil can be evaluated. All natural water used for irrigation contains some soluble salts. If water of poor quality is used on a soil with slow permeability, harmful salts are likely to accumulate in the soil unless some leaching is done. This requires an application of water in excess of the need of the crop so that some of the water passes through the root zone.

Some of the soil factors that are important to irriga-

Figure 16.—**Irrigated sorghum. In foreground are siphon tubes that draw and distribute water from an irrigation ditch. The soil is Hord silty clay loam.**

depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suita-

the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an [redacted] to the subclass symbol, for example

drained, loamy soils that have a clayey subsoil; on uplands.

Subclass IIIw. Soils that have severe limitations [redacted] because of excess water

cover, water supply, or esthetic purposes. (None in

tive grasses, sedges, forbs, and shrubs valuable for grazing. Some range is used by wildlife and for recreation.

In Ness County about 40 percent of the farm income is from the sale of livestock, milk, and other livestock products. The number of cattle, including calves, in the county usually ranges from 55,000 to 71,000.

The major source of livestock forage is range, but

gories: decreasers, increasers, and invaders, depending on their response to continuous overgrazing.

Decreasers are plants in the climax community that tend to decrease in number under continued exces-

gently sloping to moderately steep and are on uplands. They have relatively smooth and convex slopes. The soils are clayey throughout. Abundant fractures are common in the subsoil, and this allows deep penetra-

weed. Increasers, mainly western wheatgrass and tall dropseed, make up about 20 percent of the climax vegetation. Other common increasers are meadow dropseed, sideoats grama, blue grama, buffalograss, and

this site are annual bromes, little barley, annual sunflower, gumweed, windmillgrass, and tumblegrass.

If this site is in excellent condition, the average annual production of air-dry herbage is 3,500 pounds

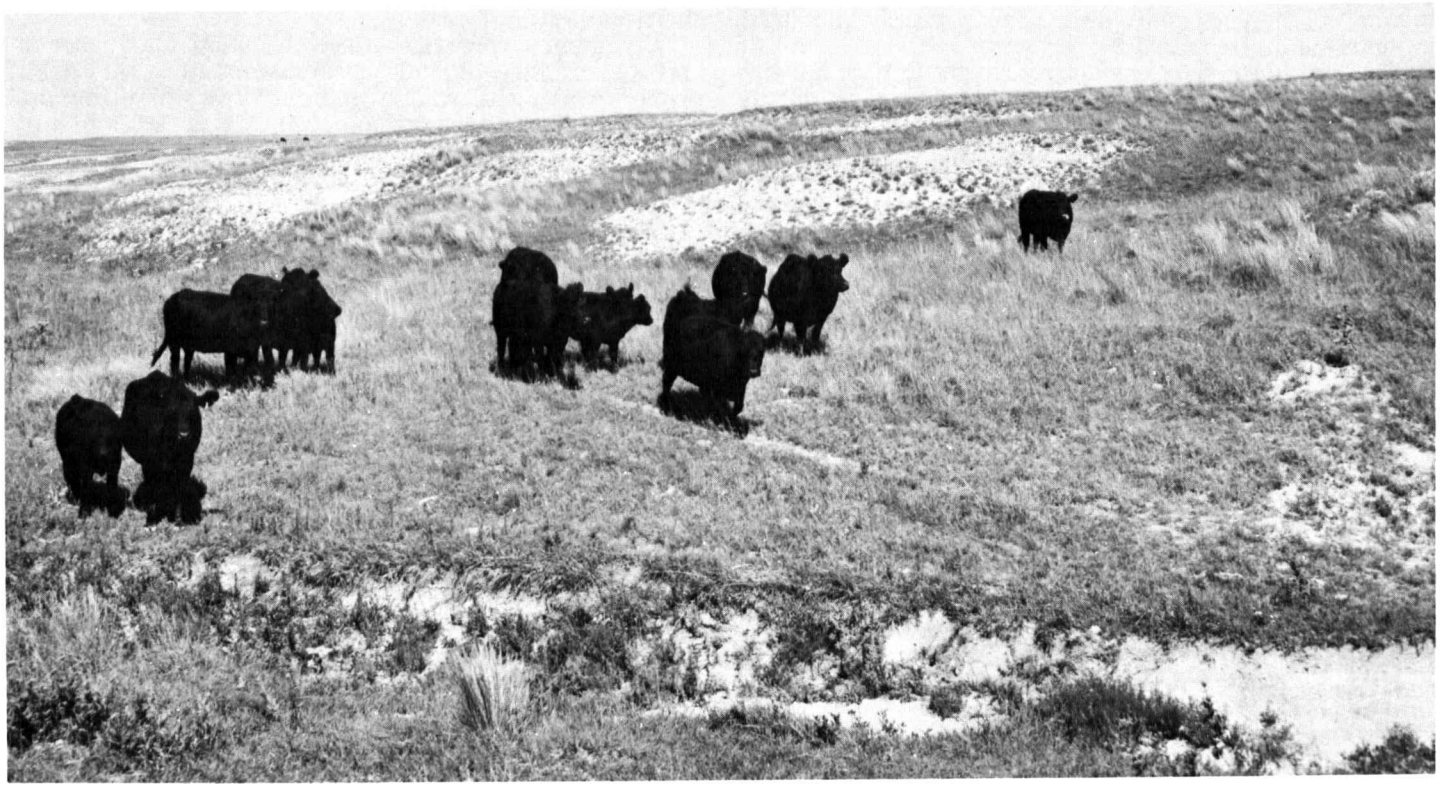


Figure 18.—Cattle in a native grass pasture on Shallow Limy range site.

wooded areas. Examples of woodland wildlife are thrushes, deer, raccoon, and squirrel. *Wetland wildlife* normally inhabit ponds, marshes, streams, and swamps. Examples are ducks, shorebirds, beaver, mink, and muskrat.

Two kinds of deer inhabit Ness County. In the western half of the county, the mule deer is dominant, but in the eastern half, the white-tailed deer is most numerous. Deer generally inhabit the Roxbury-Bridgeport-Hord association, but the population varies in density, depending on the location of woody habitat. The population is limited by a lack of suitable cover,

TABLE 4.—*Potential of soil associations for providing wildlife habitat*

which consists of woody plants. Studies of their feeding habits indicate that deer have a yearly diet that is nearly half farm crops.

and recreation opportunities will be developed to serve the needs of the area.

Management practices that are particularly benefi-

TABLE 5.—*Degree and kind of limitations of the soils for recreation development*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for referring to other series that appear in the first column of this table]

Soil series and map symbols	Camp areas	Picnic areas	Playgrounds	Paths and trails
Alluvial land, broken: Ab	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Moderate: subject to flooding; slope.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 5.—*Degree and kind of limitations of the soils for recreation development*—Continued

Soil series and map symbols	Camp areas	Picnic areas	Playgrounds	Paths and trails
*Nibson: Nw For the Wakeen part, see the Wakeen series.	Moderate where slopes are less than 15 percent: rockiness. Severe where slopes are more than 15 percent.	Moderate where slopes are less than 15 percent: rockiness. Severe where slopes are more than 15 percent.	Severe: slope; underlying chalky shale at a depth of 10 to 20 inches.	Slight where slopes are less than 15 percent. Moderate where slopes are more than 15 percent: rockiness.
*Penden: Pc, Pd, Pr, Px For the Bridgeport part of Pr and the Coly part of Px, see the Bridgeport and Coly series.	Moderate: moderately slow permeability; clay loam surface layer. Severe where slopes are more than 15 percent.	Moderate: clay loam surface layer. Severe where slopes are more than 15 percent.	Moderate: slope; clay loam surface layer. Severe where slopes are more than 6 percent.	Moderate: clay loam surface layer.
*Rock land: Rh For the Heizer part, see the Heizer series.	Severe: slope; rockiness.	Severe: slope; rockiness.	Severe: slope; bedrock at a shallow depth; rockiness.	Severe: slope; rockiness.
Roxbury:	[illegible]	[illegible]	[illegible]	[illegible]

[redacted]

TABLE 6.—*Estimated soil properties*

[redacted]

significant in engineering

soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the this table. The symbol > means more than; the symbol < means less than]

Percentage less than 3 inches passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)				
				Inches per hour	*Inches per inch of soil*	*pH*	
100	100	90–100	75–100	0.63–2.0	0.16–0.18	7.9–8.4	Low.
100	100	90–100	85–100	0.63–2.0	0.16–0.18	7.9–8.4	Low.
100	95–100	80–90	51–80	0.63–2.0	0.16–0.18	7.4–7.8	Low.
95–100	90–100	75–90	51–80	0.63–2.0	0.17–0.19	7.4–7.8	Low.
95–100	85–95	70–80	45–75	0.63–2.0	0.17–0.19	7.4–7.8	Low.
95–100	85–95	80–95	55–75	0.63–2.0	0.16–0.18	7.9–8.4	Low.
85–100	80–95	80–90	50–70	0.63–2.0	0.16–0.18	7.9–8.4	Low.
85–95	80–90	75–85	45–65	0.63–2.0	0.16–0.18	7.9–8.4	Low.
100	95–100	90–100	70–90	0.63–2.0	0.16–0.18	7.4–7.8	Low.
100	95–100	90–100	70–90	0.63–2.0	0.16–0.18	7.9–8.4	Low.
95–100	90–100	90–100	70–90	0.63–2.0	0.16–0.18	7.9–8.4	Low.
100	95–100	85–95	70–90	0.20–0.63	0.17–0.19	7.4–7.8	Moderate.
95–100	95–100	90–100	75–95	0.20–0.63	0.17–0.19	7.4–7.8	Moderate.
95–100	90–100	85–95	75–95	0.20–0.63	0.17–0.19	7.9–8.4	Moderate.
100	95–100	90–100	75–95	0.20–0.63	0.17–0.19	6.1–6.5	Moderate.
100	95–100	90–100	75–100	0.06–0.20	0.16–0.18	6.6–7.3	High.
100	95–100	90–100	75–95	0.20–0.63	0.17–0.19	7.4–7.8	Moderate.
100	95–100	90–100	75–95	0.20–0.63	0.17–0.19	7.9–8.4	Moderate.
100	100	90–100	80–100	0.63–2.0	0.16–0.18	6.1–6.5	Moderate.
100	100	90–100	80–100	0.20–0.63	0.17–0.19	6.1–6.5	Moderate.
100	100	95–100	85–100	0.20–0.63	0.17–0.19	6.6–7.3	Moderate to high
100	100	95–100	85–100	0.20–0.63	0.17–0.19	7.4–7.8	Moderate to high
100	100	95–100	85–100	0.20–0.63	0.17–0.19	7.9–8.4	Moderate.
95–100	95–100	90–100	80–100	0.20–0.63	0.17–0.19	7.9–8.4	Moderate.
85–95	70–80	60–75	40–60	0.63–2.0	0.10–0.14	7.4–7.8	Low.
65–80	55–70	50–60	30–50	0.63–2.0	0.08–0.11	7.9–8.4	Low.
55–70	35–50	35–45	20–40	0.63–2.0	0.05–0.08	7.9–8.4	Low.
100	95–100	90–100	75–100	0.63–2.0	0.17–0.19	6.6–7.3	Moderate.
100	95–100	90–100	85–100	0.63–2.0	0.17–0.19	6.6–7.3	Moderate.
100	95–100	90–100	80–100	0.63–2.0	0.17–0.19	7.4–7.8	Moderate.
95–100	90–100	85–100	80–100	0.63–2.0	0.17–0.19	7.9–8.4	Moderate.
100	100	95–100	90–100	<0.06	0.14–0.16	6.6–7.3	High.
100	100	95–100	90–100	<0.06	0.12–0.14	7.4–7.8	High.
100	90–100	90–100	80–95	0.20–0.63	0.16–0.18	7.9–8.4	High.

TABLE 6.—*Estimated soil properties*

Soil series and map symbols	Depth to bedrock	Depth from surface	USDA texture	Classification	
				Unified [1]	AASHTO
	Inches	*Inches*			
*Rock land: Rh. Properties are too variable to be estimated. For the Heizer part, see the Heizer series.					
Roxbury: Ro, Rs [2]	>60	0–21	Heavy silt loam	CL–ML or CL	A–6 or A–7
		21–60	Silty clay loam	CL	A–6 or A–7
Timken: Tx	9–20	0–4	Silty clay	CH	A–7
		4–9	Clay	CH	A–7
		9–14	Clay	CH	A–7
		14	Clay shales.		
*Uly: Ub, Uc, Ue, Ux, Uy. For the Coly part of Ue and the Corinth part of Ux and Uy, see the Coly and Corinth series.	>60	0–8	Silt loam	ML	A–4 or A–6
		8–16	Heavy silt loam	ML or CL	A–4 or A–6
		16–60	Light silty clay loam	ML or CL	A–6 or A–7
Wakeen: Wb, Wc	20–40	0–13	Heavy silt loam	ML or CL	A–4 or A–6
		13–23	Silty clay loam	CL–ML or CL	A–6 or A–7
		23–32	Silty clay loam	CL–ML or CL	A–6 or A–7
		32	Limestone.		

[1] The Soil Conservation Service and the Bureau of Public Roads have agreed that all soils that have plasticity indexes within two points of the A-line are to be given a borderline classification such as MH–CH. When the quantity of fines is between 5 percent

transmit water or air. It is estimated on the basis of those soil characteristics observed in the field, particularly structure and texture. The estimates in table 6 do not take into account lateral seepage or such transient soil features as plowpans and surface crusts.

Available water capacity is the ability of soils to hold water for use by most plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount at the wilting point of most crop plants.

Reaction is the degree of acidity or alkalinity of a soil, expressed in pH values. The pH value and terms used to describe soil reaction are explained in the

sources of sanitary landfill cover material, topsoil, sand and gravel, road subgrade, and road fill. Table 8 gives interpretations of properties of the soils for specific structures. The estimated interpretations in tables 7 and 8 are based on the engineering properties of the soils shown in table 6, on test data for soils in this survey area and others nearby, and on the experience of engineers and soil scientists with the soils of Ness County.

In table 7, the ratings for suitability as a source of sanitary landfill cover material are based on the soil properties that reflect workability, that is, the ease of digging, moving, and spreading the soil material over

significant in engineering—Continued

Percentage less than 3 inches				

Shallow excavations are those that require digging or trenching to a depth of less than 6 feet; for example, excavations for pipelines, sewer lines, phone and power transmission lines, basements, open ditches, and cemeteries. Desirable soil properties are good workability, moderate resistance to sloughing, gentle slopes, absence of rock outcrops or big stones, and freedom from flooding or a high water table.

Irrigation of a soil is affected by such features as slopes; susceptibility to stream overflow, water erosion, or soil blowing; soil texture; content of stones; accumulation of salts and alkali; depth of root zone; rate of water intake at the surface; permeability of soil layers below the surface layer and in fragipans or other layers that restrict movement of water; amount of water held available to plants; and need for drain-

[redacted]

Foundations for low buildings are affected chiefly by features of the undisturbed soil that relate to capacity to support load and resist settlement under load

age, or depth to water table or bedrock.

Soil test data

[redacted]

TABLE 7.—Suitability of the soils as construction material

TABLE 7.—*Suitability of the soils as construction material*—Continued

Soil series and map symbols	Suitability as source of—				
	Sanitary landfill	[illegible]	[illegible]	[illegible]	[illegible]

color, natural fertility, and other properties of the soil.

Parent material is formed by the mechanical and chemical weathering of rocks. Among the agents of mechanical weathering are temperature changes, freezing of water, crystal growth, plant and animal action, wetting and drying, abrasion, and corrosion (4). Chemical weathering is more complex. In most places it results in the reduction of particle size, the addition of water, oxygen, and carbon dioxide, and the loss of soluble salts of some metals such as sodium and

limited amount of rainfall in Ness County, the soils have not been weathered and leached greatly. Calcium carbonate has been leached to depths of about 18 to 30 inches in soils such as Harney, but calcium carbonate is at or near the surface in soils such as Bridgeport and Roxbury.

Plant and animal life

Plant and animal life, both on and in the soil, are active in the soil-forming processes. Small burrowing

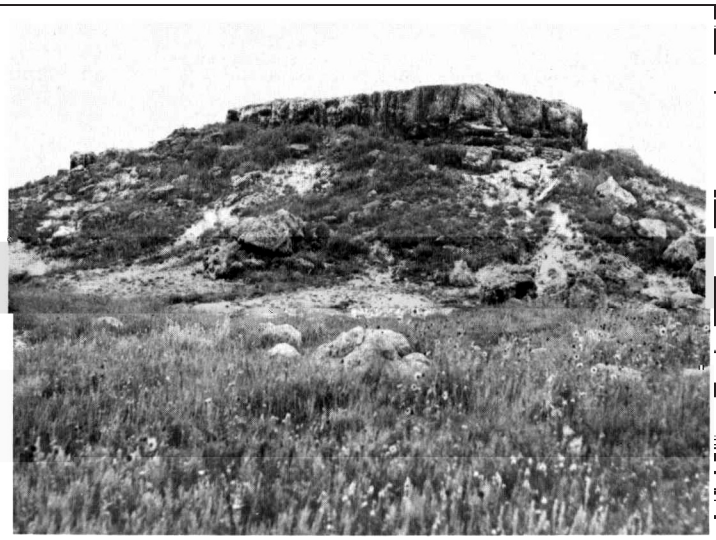


TABLE 8.—*Interpretations of*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The instructions for referring to other series

Soil series and map symbols	Degree and kind of limitation for—			
	Septic tank [illegible] fields	Sewage lagoons	Shallow excavations	Foundations for low buildings [1]

engineering properties of the soils

soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the
that appear in the first column of this table]

Degree and kind of limitation for—continued		Soil features affecting—				
Sanitary landfill		Highway location [2]	Pond reservoir areas	Embankments, dikes, and levees	Terraces, diversions, and waterways	Irrigation
Trench type	Area type					
Severe: subject to occasional flooding.	Severe: subject to occasional flooding.	Subject to flooding.	Moderate permeability; slopes of 0 to 2 percent.	Poor stability; good compaction with close control; high piping hazard.	Slopes of 0 to 2 percent; silt loam texture; moderate permeability.	Slopes of 0 to 2 percent; deep; well drained; moderate hazard of flooding; high available water capacity.
Severe: caliche at a depth of 20 to 40 inches.	Slight where slopes are less than 8 percent. Moderate where slopes are more than 8 percent.	High erodibility; slopes of 2 to 10 percent; caliche at a depth of 20 to 40 inches.	Moderate permeability; slopes of 2 to 10 percent; caliche at a depth of 20 to 40 inches.	Fair stability; fair compaction characteristics; moderate piping hazard.	Caliche at a depth of 20 to 40 inches; slopes of 2 to 10 percent; high erodibility; moderate permeability.	Caliche at a depth of 20 to 40 inches; slopes of 2 to 10 percent; well drained; low available water capacity.
Severe: slopes of 3 to 40 percent; caliche at a depth of 10 to 20 inches	Severe: slopes of 3 to 40 percent; caliche at a depth of 10 to 20 inches	High erodibility; slopes of 3 to 40 percent; caliche at a depth of 10 to 20 inches	Moderate permeability; slopes of 3 to 40 percent; caliche at a depth of 10 to	Poor stability; fair compaction characteristics; high piping	Caliche at a depth of 10 to 20 inches; slopes of 3 to	Caliche at a depth of 10 to 20 inches; slopes of 3 to

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—			
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Foundations for low buildings [1]
*Harney: Ha, Hb, Hc, Hu, Hv For the Uly part of Hu and Hv, see the Uly series.	Severe: moderately slow permeability.	Moderate: slopes of 0 to 3 percent.	Slight	Moderate to severe: moderate to high shrink-swell potential.
*Heizer: Hw For the Wakeen part, see the Wakeen series.	Severe: limestone at a depth of 10 to 20 inches; slopes	Severe: slopes of 3 to 40 percent; limestone at a depth of 10	Severe: limestone at a depth of 10 to 20 inches; slopes	Severe: limestone at a depth of 10 to 20 inches; platy

properties of the soils—Continued

Degree and kind of limitation for—continued		Soil features affecting—				
Sanitary landfill		Highway location [2]	Pond reservoir areas	Embankments, dikes, and levees	Terraces, diversions, and waterways	Irrigation
Trench type	Area type					
Moderate to severe: silty clay loam to silty clay subsoil.	Slight	Slopes of 0 to 3 percent.	Moderately slow permeability; slopes of 0 to 3 percent.	Fair stability; fair compaction characteristics; moderate to high shrink-swell potential; medium com-	Silty clay loam subsoil; slopes of 0 to 3 percent; moderate erodibility; moderately slow perme-	Slopes of 0 to 3 percent; well drained; moderate erodibility; high available water capacity.

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—			
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Foundations for low buildings [1]
Roxbury: Ro, Rs	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Timken: Tx	Severe: very slow permeability; slopes of 3 to 45 percent; shale at a depth of 9 to 20 inches.	Severe: shale at a depth of 9 to 20 inches; slopes of 3 to 45 percent.	Severe: slopes of 3 to 45 percent; shale at a depth of 9 to 20 inches; clay texture.	Severe: shale at a depth of 9 to 20 inches; slopes of 3 to 45 percent; CH soil group; high shrink-swell potential.
*Uly: Ub, Uc, Ue, Ux, Uy For the Coly part of Ue and the Corinth part of Ux and Uy, see the Coly and Corinth series.	Slight: moderate permeability.	Moderate: moderate permeability; slope.	Slight	Moderate: moderate shrink-swell potential; ML or ML–CL soil group.
Wakeen: Wb, Wc	Severe: limestone at a depth of 20 to 40 inches.	Severe: limestone at a depth of 20 to 40 inches.	Severe: limestone at a depth of 20 to 40 inches.	Moderate: moderate shrink-swell potential; limestone at a depth of 20 to 40 inches. Severe for basements.

[redacted]

properties of the soils—Continued

Degree and kind of limitation for—continued		Soil features affecting—				
Sanitary landfill		Highway location [2]	Pond reservoir areas	Embankments, dikes, and levees	Terraces, diversions, and waterways	Irrigation
Trench type	Area type					
Severe: subject to flooding.	Severe: subject to flooding.	Subject to flooding.	Moderate permeability; slopes of 0 to 1 percent.	Fair stability; good compaction characteristics; moderate shrink-swell potential; fair shear strength.	Slopes of 0 to 1 percent; moderate permeability; high fertility; moderate hazard of flooding.	Moderately well drained; deep; moderate hazard of flooding; high available water capacity.
Severe: slopes of 3 to 45 percent; clay texture; shale at a depth of 9 to 20 inches.	Slight where slopes are less than 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are more than 15 percent.	Poor foundation; shale at a depth of 9 to 20 inches; slopes of 3 to 45 percent.	Shale at a depth of 9 to 20 inches; slopes of 3 to 45 percent; very slow permeability.	Fair stability in level areas; poor compaction characteristics; high shrink-swell potential.	Shale at a depth of 9 to 20 inches; slopes of 3 to 45 percent; very slow permeability; low fertility.	Shale at a depth of 9 to 20 inches; slopes of 3 to 45 percent; moderately well drained; very slow permeability.
Moderate: silty clay loam subsoil.	Slight ----------	Moderate erodibility; slopes of 1 to 6 percent.	Moderate permeability; slopes of 1 to 6 percent.	Fair stability; fair compaction characteristics; moderate piping hazard; moderate erodibility; moderate shrink-swell potential.	Slopes of 1 to 6 percent; silty clay loam subsoil; high available water capacity; moderate erodibility.	Slopes of 1 to 6 percent; well drained; deep; high available water capacity; moderate permeability; moderate erodibility.
Severe: limestone at a depth of 20 to 40 inches.	Slight where slopes are less than 8 percent. Moderate where slopes are 8 to 15 percent	Moderate erodibility; limestone at a depth of 20 to 40 inches; slopes of 1 to 15 per-	Moderate permeability; limestone at a depth of 20 to 40 inches; slopes of 1 to 15 per-	Poor stability; high piping hazard; good compaction with close control	Slopes of 1 to 15 percent; limestone at a depth of 20 to 40 inches; moder-	Limestone at a depth of 20 to 40 inches; slopes of 1 to 15 percent; mod-

TABLE 9.—*Engineering*

[Tests performed by the State Highway Commission of Kansas in accordance with standard procedures of

Soil name and location	Parent material	Report number	Depth	Moisture density [1]	
				Maximum dry density	Optimum moisture
			Inches	*Lb/cu ft*	*Pct*
Bridgeport silt loam:	Recently deposited	S69 Kans			
240 feet south and 130 feet east of northwest corner of NE¼ section 8, T. 19 S., R. 23 W. (Modal)	alluvium.	68–1–1	0–14	99	20
		68–1–2	14–23	100	19
		68–1–3	23–58	108	15
Harney silt loam:	Calcareous loess.	S68 Kans			
100 feet east and 70 feet south of northwest corner of section 22, T. 20 S., R. 23 W. (Modal)		68–2–1	0–5	103	18
		68–2–2	11–17	97	23
		68–2–3	24–33	96	23
		68–2–4	33–47	96	24
Penden silty clay loam:	Calcareous loamy	S69 Kans			
1,440 feet north and 300 feet west of southeast corner of section 11, T. 17 S., R. 26 W. (Modal)	sediments modified by silty loess material.	68–3–1	0–8	104	17
		68–3–2	14–32	108	18
		68–3–3	32–65	110	13
Roxbury silty clay loam:	Alluvium.	S68 Kans			
2,080 feet east and 1,320 feet north of south-		68–1–1	5–18	100	21
		68–1–2	18–33	96	23

test data

the American Association of State Highway and Transportation Officials (AASHTO) (*1*), except as noted]

Mechanical analysis [2]							Liquid limit	Plasticity index	Classification	
Percentage less than 3 inches passing sieve—			Percentage smaller than—							
No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	0.05 mm	0.02 mm	0.005 mm	0.002 mm			AASHTO	Unified [3]
100	99	96	78	52	29	22	39	15	A–6(10)	CL–ML
100	99	93	83	56	29	21	35	13	A–6(9)	CL–ML
100	99	95	82	43	20	15	30	8	A–4(8)	CL–ML
100	100	96	85	50	28	19	33	12	A–6(9)	CL
100	100	97	90	70	51	44	57	34	A–7–6(19)	CH
100	100	98	95	68	43	37	43	19	A–7–6(12)	CL
100	100	99	97	69	40	30	44	18	A–7–6(12)	CL–ML
98	86	66	58	38	22	17	38	16	A–6(9)	CL
100	92	78	71	52	34	28	37	17	A–6(11)	CL
100	90	78	73	55	36	27	33	15	A–6(10)	CL
100	100	96	84	60	36	27	41	19	A–7–6(12)	CL
100	100	98	91	65	41	31	43	21	A–7–6(13)	CL
100	100	98	95	77	51	42	47	24	A–7–6(15)	CL

would have been obtained by soil survey procedure of the Soil Conservation Service (SCS). In the AASHTO procedure, the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method, and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soils.

[3] SCS and BPR have agreed to consider that all soils having plasticity indexes within two points of the A-line are to be given a borderline classification. An example of a borderline classification obtained by this use is CL–ML.

Legislature, was designated the 52nd county in 1868, and officially proclaimed as organized in 1873 (*5*). The earliest settlers came in the summer of 1873, but settlers did not begin to claim land in significant numbers until about 1875 or 1876. Since that time, according to figures taken from reports of the Kansas State Board of Agriculture, the population of the county has decreased from about 8,400 in 1932 to about 5,300 in 1969. Ness City, the county seat and largest town in the county, had a population of 1,881 in 1969. According to the 1964 Census of Agriculture, the density of population is 5 people per square mile.

When the early settlers arrived, native grass covered the soil. There were few trees in the county, and these were only along the major streams. As the county was settled, the lack of timber for use as fenceposts and building material forced the settlers to seek other material. Consequently, Greenhorn Limestone, the upper layer of which is now named Fencepost Limestone, was widely quarried for fenceposts and building stone in the early days, and many of the posts and some buildings still stand (*5*). Greenhorn Limestone either crops out or is near the surface in the eastern part of the county, along the drainageways of Walnut Creek and the Pawnee River.

Farming is the main enterprise in Ness County. According to the 1964 Census of Agriculture, there are 747 farms in the county averaging 938 acres in size. Nearly all of the land area of the county is in farms. Livestock and livestock products accounted for 63 percent of the value of farm products sold in 1964, and crops accounted for 37 percent. According to the Conservation Needs Inventory of 1967, about 60 percent of the county is used for dryfarming and about 1 percent is irrigated. The rest, excluding towns, roads, and other built-up areas, is used for pasture and range.

Corn was the main grain crop grown in Ness County until about 1890, when it gave way to wheat. Wheat is still the main crop, but much sorghum is grown, especially in the irrigated areas in the valleys of Walnut Creek and the Pawnee River. Farming in Ness County today is on a large scale and is highly mechanized.

The following trends in the acreages of the main crops in Ness County are based on biennial reports of the Kansas State Board of Agriculture and on the Kansas State Board of Agriculture publication "Farm Facts." The acreage in corn decreased from 18,054 in 1929 to 3,000 in 1969; that in wheat increased from 251,000 in 1929 to 310,000 in 1949, but decreased to 185,000 in 1969. The total acres of sorghum harvested for grain, silage, and forage, was 34,950 in 1949 and 32,300 in 1969.

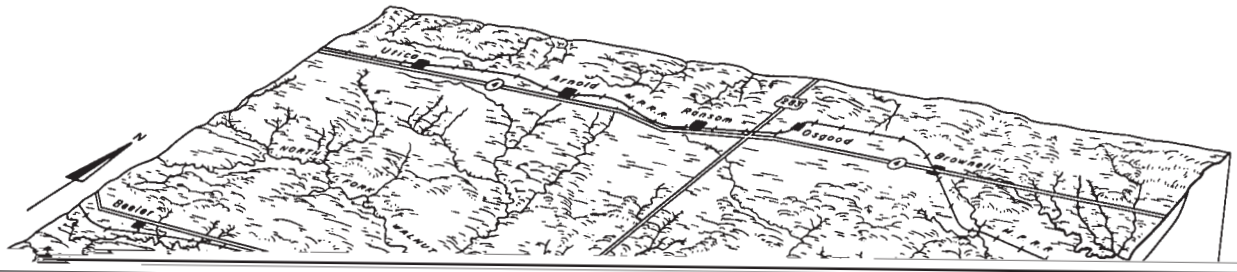
[Classification as of March 13, 1970, or as classified in more recently revised series descriptions]

Soil series	Family	Subgroup	Order
Bridgeport	Fine-silty, mixed, mesic	Fluventic Haplustolls	Mollisols.
Campus	Fine-loamy, mixed, mesic	Typic Calciustolls	Mollisols.
Canlon	Loamy, mixed, calcareous, mesic	Lithic Ustorthents	Entisols.
		Typic Ustorthents	Entisols.

TABLE 11.—*Temperature and precipitation*

[Data from records kept at Ness City]

Month	Temperature				Precipitation		
	Average daily maximum [1]	Average daily minimum [1]	Two years in 10 will have about 4 days with—		Average monthly total [2]	One year in 10 will have—	
			Maximum temperature equal to or	Minimum temperature equal to or		Totals less	Totals greater


Utica
Arnold
Ragan
Osgood
Brownell
N
Buelah
North
Fork
Walnut

Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali soil. Generally, a highly alkaline soil. Specifically, an alkali soil has so high a degree of alkalinity (pH 8.5 or

called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from

[redacted]

GUIDE TO MAPPING UNITS

For complete information about a mapping unit, read both the description of the mapping unit and that of the soil series to which it belongs. An explanation of the capability classification begins on page 21, and a list of the capability classes and the subclasses and units in Ness County is on page 22. Windbreak groups are discussed in the section that begins on page 23. Other information is given in tables as follows:

Acreage and extent, table 1, page 7.
Predicted yields, table 2, page 23.
Trees and shrubs suitable for windbreaks, table 3, page 24.
Wildlife, table 4, page 27.
Recreation, table 5, page 29.
Use of the soils in engineering, table 6, page 32; table 7, page 37; and table 8, page 40.

Map symbol	Mapping unit	Page	Capability unit Dryland Symbol	Capability unit Irrigated Symbol	Range site Name	Range site Page	Windbreak suitability group Number
Ab	Alluvial land, broken	7	VIIw-1	------	----------	--	---
Br	Bridgeport silt loam	8	IIc-2	I-1	Loamy Terrace	26	1
Cc	Campus-Canlon complex	8	VIe-2	------	----------	--	---
	Campus portion	--	------	------	Limy Upland	25	---
	Canlon portion	--	------	------	Shallow Limy	26	---
Cu	Coly-Uly silt loams, 3 to 6 percent slopes, eroded	10	IVe-1	------	----------	--	2
	Coly portion	--	------	------	Limy Upland	25	---
	Uly portion	--	------	------	Loamy Upland	26	---
De	Detroit silty clay loam	11	IIc-3	I-2	Loamy Terrace	26	1
Ha	Harney silt loam, 0 to 1 percent slopes	12	IIc-1	I-3	Loamy Upland	26	2
Hb	Harney silt loam, 1 to 3 percent slopes	12	IIe-1	IIe-1	Loamy Upland	26	2
Hc	Harney silty clay loam, 1 to 3 percent slopes, eroded	12	IIIe-3	------	Loamy Upland	26	2
Hu	Harney-Uly silt loams, 0 to 1 percent slopes	12	IIc-1	I-3	Loamy Upland	26	2
Hv	Harney-Uly silt loams, 1 to 3 percent slopes	12	IIe-1	IIe-1	Loamy Upland	26	2
Hw	Heizer-Wakeen complex	13	VIe-2	------	----------	--	---
	Heizer portion	--	------	------	Shallow Limy	26	---
	Wakeen portion	--	------	------	Limy Upland	25	---
Hz	Hord silty clay loam	14	IIc-2	I-1	Loamy Terrace	26	1
Nc	Ness clay	14	VIw-1	------	----------	--	---
Nw	Nibson-Wakeen complex	15	VIe-2	------	Limy Upland	25	---
Pc	Penden clay loam, 3 to 6 percent slopes	15	IIIe-2	------	Limy Upland	25	2
Pd	Penden clay loam, 3 to 6 percent slopes, eroded	16	IVe-1	------	Limy Upland	25	2
Pr	Penden-Bridgeport complex	16	VIe-1	------	----------	--	2
	Penden portion	--	------	------	Limy Upland	25	---
	Bridgeport portion	--	------	------	Loamy Lowland	25	---
Px	Penden-Coly complex	16	VIe-1	------	Limy Upland	25	---
Rh	Rock land-Heizer complex	16	VIIs-1	------	----------	--	---
	Rock land portion	--	------	------	----------	--	---
	Heizer portion	--	------	------	Shallow Limy	26	---
Ro	Roxbury silt loam	17	IIc-2	I-1	Loamy Terrace	26	1
Rs	Roxbury silt loam, frequently flooded	17	IIIw-1	------	Loamy Lowland	25	1
Tx	Timken complex	18	VIIs-2	------	Blue Shale	25	---
Ub	Uly silt loam, 1 to 3 percent slopes	18	IIe-2	IIe-1	Loamy Upland	26	2
Uc	Uly silt loam, 3 to 6 percent slopes	18	IIIe-2	------	Loamy Upland	26	2
Ue	Uly-Coly silt loams, 1 to 3 percent slopes, eroded	18	IIIe-1	------	----------	--	2
	Uly portion	--	------	------	Loamy Upland	26	---
	Coly portion	--	------	------	Limy Upland	25	---
Ux	Uly-Corinth complex, 1 to 3 percent slopes	19	IIIe-1	------	----------	--	3
	Uly portion	--	------	------	Loamy Upland	26	---

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